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Conservative Treatment of Vascular Graft Infections in the Groin

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Introduction

Clinical implications of vascular graft infection vary according to the position of the implanted graft. The infected aortic bifurcation graft is associated with a high incidence of therapeutic failure and also a high mortality rate.[1–5] In comparison, the mortality rate is low following infection of an infrainguinal bypass graft, but the risk of major amputation approaches 80%.[6,7] The close anatomical relation to the perineal area and the poor vascularisation of the subcutaneous tissue combined with a rich regional lymphatic supply predispose the groin to wound infection. Thus, not only local contamination, but also haematogenous and lymphogenic spread from other infectious sites may contribute to the high incidence of infectious complications in the groin. According to Herbst *et al.*[8] one out of three graft infections is caused by microorganisms originating from the patient's ischaemic ulcer, corroborating the observation by Lorentzen *et al.*[1] that 20% of foot ulcers yield the same microorganism as isolated from the graft.

Management of infected vascular prostheses is controversial. One approach is to remove the graft with a new extra-anatomic arterial reconstruction in one or two procedures[9]; but it is associated with a high level of complications and bears a high mortality, especially with the involvement of an aortobifemoral graft.[5,10,11] The other approach involves less extensive procedures in combination with administration of potent antibiotics.[5,6,12–15] With this approach excellent results have been reported even in patients with aortic graft sepsis.[16] One such antibiotic is gentamicin applied to the region of the infection, e.g. the groin.[12,13] In our first reports on this treatment, results from 14 and 17 patients, respectively, were presented.[12,13] In this report the number of patients has increased to 38 with a follow-up period of up to 6 years, mean 13 months.

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Material and Methods

Since 1989 all patients undergoing vascular surgery in our department have been monitored prospectively.[17] In this study patients from 1989–1993 with graft infection affecting the groin were included. Some additional information was retrospectively obtained from the patient files. Besides patients with primary graft infection from our own department, patients referred with graft infection from four other vascular departments covering 2 million inhabitants were also included in the study. Twenty female and 28 male patients with a median age of 70 years (range 48–89 years) were included in the study, with a mean follow-up time of 13 months. In 40% of the patients the onset of infection was within 1 month; in 63% within 3 months and in 79% within 2 years (Fig. 1). Twenty-six patients had an aortofemoral bypass and three an axillofemoral bypass to one or both groins. The other 19 patients had an infrainguinal bypass.

Patients were treated with either radical excision of all prosthetic material or with local wound revision, in some cases combined with partial resection of the infected prosthesis in the groin or with local graft replacement. In 38 patients local treatment included systemic antibiotics with a median period of 4 weeks; in 32 patients supplemented with local application of antibiotics in the form of gentamicin containing collagen[12] or gentamicin beads.[13]

Morbidity was evaluated in terms of recurrent infections and amputations. Survival data were evaluated according to the Kaplan–Meier life-table method.[18]

Results

No significant differences in morbidity and mortality were detected between patients operated with a suprainguinal or an infrainguinal bypass (Table 1). Ten

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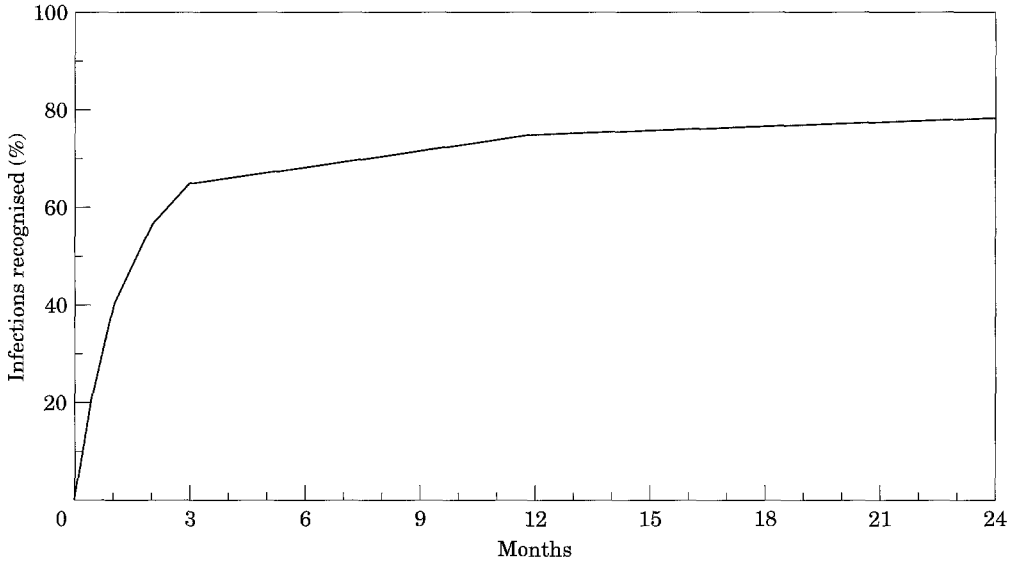

Fig. 1. Time from primary graft-insertion to the onset of infection in the groin for 48 patients.

Table 1. Patients operated for graft infection divided according to the anatomic location and to the treatment. "Early" indicates within 30 days after the operation.

	Graft		Treatment			Total
	Aortofemoral	Infrainguinal	Radical excision	Local resection	Wound revision	
Patients	29	19	10	9	29	48
Occluded graft at time of operation for infection	5	6	5	6	0	11
Early recurrent infection	7	3	1	3	6	10
Late recurrent infection	5	2	1	2	4	7
Early major amputation	2	5	3	3	1	7
Early death	2	0	2	0	0	2

patients had signs of pan-infection, with septicaemia and/or computed tomography (CT)-verified abdominal graft involvement, and they were treated with total graft excision and concomitant revascularisation. The other 38 patients were treated locally in the groin: nine with local graft resection or replacement and 29 with wound revision. Within 30 days of the operation two patients died, both in the group treated with radical excision. The 3-year survival rate was 47% and markedly lower than the expected 87% in a comparable age- and sex-matched background population. The cause of death could be established in five patients: two early deaths were from graft-related septicaemia and three late deaths from myocardial infarction (after 9 months), mesenteric thrombosis (6 months) and continuing graft infection (2 months). Thirty-seven grafts were patent at the time of operation, while 11 were occluded and treated with either radical excision or local resection (Table 1).

The cultures taken peroperatively revealed Gram-positive cocci in 20 patients (41%), intestinal species in 20 (41%) and in eight patients (17%) they were sterile (Table 2). Recurrent infection occurred in 15 of the 38 patients treated locally (37%), in nine within 30 days and in six at a later stage. Seven recurrent infections occurred in the 16 patients treated with gentamicin containing collagen: six in the sixteen patients with gentamicin beads and two in the six patients without local antibiotics. The treatment of recurrent infection included radical excision in six patients, local graft resection in five patients and local wound revision in three patients. One patient received systemic antibiotics only. Ten patients had need of only one additional revision and five patients up to five repeated

Table 2. Bacteriological findings of cultures taken from the groin at the operation.

	Numbers	Percent
Staphylococcus aureus	16	33
Staphylococcus epidermidis	4	8
Pseudomonas aeruginosa	3	6
Other monocultures	4	8
Mixed cultures of intestinal species	13	27
Sterile	8	17
Total	48	

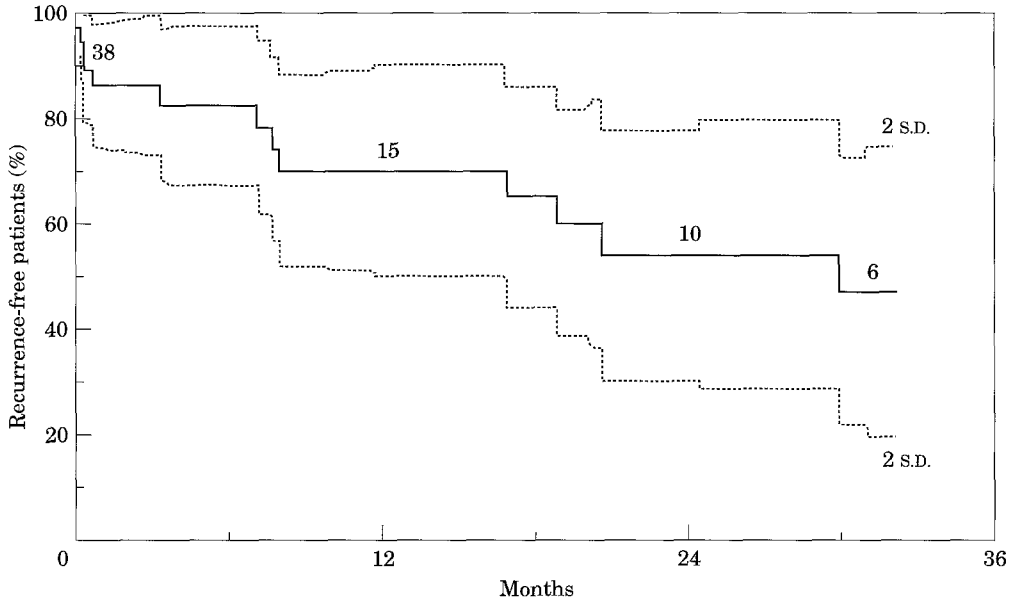

Fig. 2. Recurrence-free observation time after the last known revision for 38 patients treated locally in the groin.

revisions. The mean recurrence-free observation time after the final revision were 12 months (Fig. 2). There was one death within 30 days of secondary revision.

Discussion

Management of an infected synthetic graft in the groin is complex. The common approach is total graft removal and a new reconstruction, which can be carried out *in situ* or, in order to avoid the infected area, through an extra-anatomic approach. This radical treatment bears a high morbidity and mortality in these often weakened patients, and a more conservative approach is attractive. The results of this study indicate that patients without septicaemia or evidence of pan-infection benefit from minimal surgical treatment with graft preservation and revision in combination with both systemic and locally applied antibiotics. Still, despite a low mortality, the amputation rate was 26% for patients with infrainguinal bypass.[1,6,14]

Powerful broad spectrum systemic antibiotics are required for the management of vascular graft infections.[16] In addition, the application of antibiotics within a closed wound after revision of infection is possible with gentamycin beads or collagen plates.[12,13] These therapeutic measures were proven useful but not completely satisfactory in the present study, as therapeutic failure did become manifest.[6,10,15] A success rate of 50% after 3 years, however, allows for some optimism. A median of 2 months between the primary operation and manifestation of infection is in accordance with the multicentre study from Denmark,[1] while others report a median time to presentation of 4 months[16] and 41 months in cases of infection with *Staphylococcus epidermidis*.[19] The bacteriological profile of the infecting organisms was in accordance with that found by others[1,3,4], in that almost half of

the infecting organisms were Gram-positive cocci and 17% were sterile cultures.

Conclusion

A conservative approach including wound revision and antibiotics applied both systemically and locally is preferable as the first choice in patients with prosthetic infection in the groin without evidence of pan-infection.

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